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December 31, 1957

Technical Report No. 1

Research and Studies

National Merit Scholarship Corporation

The purpose of this paper is to describe the progress and present status of research studies being conducted by the National Merit Scholarship Corporation. Research is currently supported by funds from the National Science Foundation, the Old Dominion Foundation, and the National Merit Scholarship Corporation. Before research findings and plans are discussed, the context from which research questions arise and the major problem areas which have emerged will be outlined.

Framework for Research on Talented Students

There are at least two sources for the recent development of interest in research on the selection and training of talented youth. The first arises from the desire to solve certain recurring problems in the administration of scholarship programs in order that the scholarship funds presently available may be used more effectively. The second comes from recent discussions of the scientific manpower problem in the United States which have led to the growing realization among responsible persons that survival dictates we learn how to improve our methods of enabling talented students to obtain advanced training.

The administration of any scholarship program requires decisions about a variety of problems: What measures of scholastic aptitude and of academic performance should be used in selecting recipients? What weight should be given to accomplishments outside the classroom or to evidence of unusual motivation? How should the amount of the stipend be determined? Each of these decisions would be simplified if knowledge were available on the consequences of the different choices open to policymakers. Finding answers to most of the problems requires systematic observation and extended follow-up. A long-range research program which anticipates the types of problems to be faced represents the best hope for reducing the necessity of making arbitrary decisions.

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A scholarship program is designed to fulfill certain values by virtue of its specific actions and policies. The following formulation of the goals of scholarship assistance appears to fit the needs of society: scholarships are given in order to maximize the contributions of talented youth to society. Scholarships are usually awarded for the purpose of increasing the number of persons who will prove to be outstandingly creative or productive in their later careers. The need for better methods of selecting the most promising scholarship recipients has been a major factor in the development of programs of research on identification of the talented.

A keen awareness of the consequences of falling behind in the race to develop potential scientists and engineers has prompted extensive support of research on problems relating to our national supply of scientific personnel. The problem here is twofold: first, we must discover what incentives are effective in motivating talented students to seek advanced training in basic and applied sciences; secondly, we must learn more about the types of educational environments conducive to scientific productivity and creativity.

The recurring problems which arise in trying to meet society's need to utilize effectively its supply of talented manpower suggest three important

areas of investigation: the selection, motivation, and education of talented students. Accordingly, the first three goals of the present research program are aimed at improving methods of selecting, motivating, and educating talented students.

Since research in these three areas would be greatly facilitated by the development of a systematic set of concepts for analyzing college-going behavior, a fourth broad research area is concerned with discovering the determinants of educational and career choices of able students. This research is aimed at clarifying concepts and developing consistent and testable theories of the college-going behavior of talented students.

Finally, it is the responsibility of the research staff to serve as a central agency for collecting and interpreting information about the population of gifted students with which the Merit Program deals. Hence a fifth research area is aimed at discovering the distribution of talent and identifying the factors which limit the development of educated talent.

The first section below describes the results achieved during the first year, January 1 to December 31, 1957. The second section describes plans for longitudinal studies. Final sections give information about the research staff and enumerate research studies completed.

A Classified Summary of Research Studies--January 1 to December 31, 1957

I. Establishing selection procedures which will result in awarding scholarships to potentially highly productive or creative persons.

1.0 Studies of the Effectiveness of Current Selection Methods

1.1 A study of the selection decisions made by the 1957 selection committee shows that the committee placed greatest reliance (r=.42) on high school rank. Principal's prediction of college rank and SAT score (2V+M) were the next most heavily weighted items of information, although correlations for the latter were relatively low (.23 and .22). Low but fairly consistent positive correlations were also found between selection and the following: student's list of scholastic honors won, student's list of elective offices held, principal's comments on academic progress and on accomplishments outside of classroom, and student's list of extra-curricular activities. (cf. ref. 13)[1]

1.2 A study is planned in which 1957 Scholars and non-selected candidates will be compared with respect to freshman college grades. The predictive validities of each item related to selection decisions (cf. I. 1.1) will be ascertained.

1.3 The effectiveness of the principal selection variables was tested by correlating high school rank, SAT, and SQT with the first year college grades of 1956 Merit Scholars. These relationships were estimated (1) for the total samples of males and females, (2) for science majors versus non-science majors, (3) for individual colleges with 14 or more Merit Scholars, and (4) for the best multiple combinations of variables. In general, the results suggest that the present selection variables have substantial validity and that higher validities can be obtained by both multiple regression and differential prediction methods. (cf. ref. 11)

2.0 Studies of the Effectiveness of New Selection Methods

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[1] Numbers refer to studies enumerated in the final section of this paper.

2.1 A test battery which includes background and biographical questions, as well as personality, interest, and study-attitude items, will be administrated to 1958 finalists. The scales in this battery were selected on the basis of previous research which suggest their usefulness in predicting academic achievement or creative ability in science and related fields of study.

II. Determining the means for motivating highly talented students to seek appropriate advanced training

1.0 Studies of the loss of talent

1.1 A survey of the literature on loss of talent and on scholarship aid programs was completed. Though financial need is often cited as the chief deterrent to college attendance, the literature suggests that a great range of attitudinal, social, educational and personal factors also affect college attendance. Furthermore, many of these influences operate to reduce school attendance before high school graduation, so that there is a marked loss of talent before high school graduation as well as between high school and college.

1.2 A clinical study was made of the factors related to resignations and withdrawals among 1956 and 1957 Merit Scholars. Resignations are students who accept a National Merit Scholarship but resigned prior to entering college. There were 62 resignations in the 1956 group and 150 in the 1957 group. The chief reason for resignations in 1957 appears to be the ability to obtain a larger stipend from other scholarship programs, while the relatively late notification time seemed to be the major factor influencing 1956 resignations. "Withdrawals" refer to those students who leave college after the fall admission date. There were only seven withdrawals (or one per cent) among the 1956 Scholars. Withdrawals and resignations will be cumulated year by year to provide more definitive explanations of student scholastic failure and rejection of Merit Scholarship aid.

1.3 A study is now in progress which will estimate the "talent loss" among 1957 finalists and semi-finalists, and which will attempt to identify factors related to the magnitude of the drop-out loss among talented students. "Drop-outs" are students who fail to attend college in the fall semester following graduation from high school. Drop out rate will be related to aptitude test scores, family background factors (including family resources), attitudes toward intellectualism, and other factors.

2.0 Studies of the effects of Merit Scholarships upon college-going behavior.

2.1 An analysis of the retrospective evaluations of the effects of Merit Scholarships by 536 Merit Scholars in the 1956 program shows that only two per cent report they probably would not have attended college otherwise. Three per cent state that their college educations would have been delayed if they had not had scholarship aid. One out of seven believes that receiving a scholarship caused them to raise, or at least to change, their vocational goals. Thirty-five per cent report that they would probably be attending a different institution if they had not received a Merit Scholarship. These results suggest that the concentration of talented students at the most popular colleges (among Scholars) has been increased by Merit Scholarships: 46 per cent of the Scholars are attending one of the 13 most popular institutions, whereas only 29 per cent state that they would be going to one of these institutions if they had not received a Merit Scholarship. Another important finding is that the percentages of Scholars intending to major in science decreased during the freshman year (from 72 per cent at the beginning to 65 per cent at the end of the first year). (cf. ref. 4)

2.2 An ex post facto experimental comparison is now in progress in

which a group of 1957 Merit Scholars matched with a group of Certificate of Merit (C of M) winners will be compared with respect to college attendance, college choice, academic achievement in college, and motivation to seek advanced degrees. The two groups will be matched as closely as possible on SAT scores (V+M), financial resources, rural vs. urban residence, sex, father's occupation, and vocational aspiration. A major aim of this study is to obtain information by which it will be possible to identify students whose college-going behavior will be affected by scholarships. Financial assistance may increase the number of talented students going to college when financial resources of the family are low, but may have no effect when resources are greater. Or it may be that scholarships to students coming from rural communities will affect college-going behavior more than scholarships to students from urban communities. In short, a search will be made for variables which influence the effectiveness of scholarships.

3.0 Studies of the effects of the C of M award on college-going behavior.

3.1 Of the 1956 C of M winners asked to evaluate the effects of receiving the honorary award, one fourth believed that the awards helped them to secure outside scholarship aid. Sixty-five per cent report that they received some scholarship help, the average stipend for men being $659, and for women, $489. These figures compare favorably with the average stipend of $628 for 1956 Merit Scholars. Only one per cent of the respondents reported they had not attended a college or university. (cf. ref. 2)

3.2 In a current study, the college-going behavior of two groups - the 1957 C of M winners and a matched group of candidates who received letters of commendation (recommended group) - is being compared. The two groups will be matched on SAT scores, high school curriculum, financial resources, geographical region, sex, and percentile rank in high school graduating class. The groups will be compared with respect to college attendance, college and career choices, winning of scholarships, and plans to pursue higher degrees.

III. Comparing educational environments to determine which are conducive to the intellectual development of talented young people.

1.0 Studies of secondary school environments conducive to the development of intellectual talent.

1.1 Merit Scholars in the 1956 group were asked to give retrospective appraisals of their high school preparation; a study of their responses shows that this sample of talented students is satisfied with training received in high school. About 9 out of every 10 students evaluated their high school preparation as adequate or excellent. Students who come from smaller schools and smaller communities tend to be more critical of their high schools. Merit Scholars are relatively satisfied with their preparation in mathematics and chemistry; they are less satisfied with the training they received in the social sciences and English. (cf. ref. 5)

2.0 Studies of college or university environments conducive to the development of intellectual talent.

2.1 A study is now in progress which will compare institutions of higher learning which are extremely effective in producing students who later earn Ph.D's with those institutions which are below average in this respect. The design attempts to control differences between institutions with respect to quality of initial talent supply by studying the regression of number of prospective Ph.D's produced per institution on the rate at which highly talented students are initially enrolled in the institution. The college choices of some

9,000 finalists in the 1956 and 1957 programs will provide an index of the degree to which the college initially enrolls exceptionally talented students. National Research Council data will be the source for the number of prospective Ph.D's produced at each baccalaureate institution. The study is aimed at discovering the kinds of educational environments which are most conducive to the production of students who later earn Ph.D's in science and non-science fields.

IV. Analyzing the determinants of educational and career choices of able students (including studies of how students select colleges and major areas of study).

1.0 Studies of the process of college choice

1.1 This study retests some of the Knapp-Goodrich hypotheses concerning the undergraduate origins of scientists. Samples of Merit Scholars and C of M winners reveal that colleges with high indices of scientific productivity are attended more frequently by high aptitude students. Students selecting colleges with "high" indices tend to have fathers who are workmen, scientists, and teachers. Students selecting colleges with "low" indices tend to have fathers who work in clerical, persuasive and esthetic occupations. In addition, students who attend colleges which have high indices of scientific productivity tend, in explaining their college choices, to stress preferences for colleges which are small, accredited, and which have a liberal arts tradition and a research reputation.

In short, this study strongly suggests that at least part of the differential production of scientists and scholars can be attributed to the number and kind of high aptitude students attracted to the various colleges. (cf. ref. 1)

1.2 This preliminary study explores the relation between student reports of how they chose a particular college and the following variables: college popularity (more popular versus less popular colleges), college scientific productivity (colleges with "high" versus "low" indices of scientific productivity) and sex differences. (cf. ref. 3)

1.3 A study is now in progress to determine the personal and social influences which determine choice of college. College choice is defined as the choice of "popular versus unpopular" colleges, "public versus private" colleges, etc. College choice will be related to family socio-economic status, college choice of peers, student personality and attitudinal variables, and student and parental perceptions of "desirable" colleges. (This study is an outgrowth of ref. 3.)

2.0 Studies of the process of vocational choice

2.1 A theory of vocational choice was developed to guide research on the vocational goals of Scholars. Essentially, the theory assumes that vocational choice is a product of the life history and the environments in which choices are made. The theory is intended to be comprehensive enough to integrate existing knowledge but also sufficiently close to observables to stimulate further research. (cf. ref. 10)

V. Discovering the distribution of talent and the factors limiting the development of educated talent.

1.0 Studies of the concentration of talent

1.1 This study was prepared to provide a summary of the available information about Merit Scholars in terms of their selection, geographical distribution, school origin, scholastic ability, personality as revealed in their hobbies, extra-curricular activities, socio-economic status, life goals and

values. Findings are summarized in composite descriptions of the typical male and female Scholars. (cf. ref. 8)

1.2 A study of the factors affecting the college's enrollment of talented students is now in progress. The college choices of over 9,000 finalists in the 1956 and 1957 programs will provide an estimate of a given institution's supply of talented students. The college's talent supply will be related to the number of scholarship offers made, and the amount of the offers, and to ecological and structural characteristics of the institution.

1.3 A study is now in progress on the characteristics of C of M winners and members of the Recommended Group who received offers of scholarship aid. The number of offers received and the amount of freshman scholarship held will each be related to aptitude scores, achievement in high school, sex, number of applications made, and related variables.

Directions for Future Research

Studies during this first year have necessarily been exploratory and diversified. In the initial stages of the research program it was necessary to explore a variety of promising leads in order to locate the research questions which merit the most intensive study and development. The results obtained suggest several important directions for future research.

In the area of selection it appears desirable to focus further research on the non-intellective predictors of achievement and creativity, and on the development of more adequate criteria for assessing productivity in undergraduate and post-graduate work. Research of the past twenty years suggests that the prediction of academic and life success by means of ability and aptitude tests has probably reached a ceiling and that in order to achieve substantial improvement we must supplement aptitude test scores with other kinds of predictors such as personality, attitudinal, and interest variables.

The findings with respect to the second area, the educational motivation of the talented, indicate the importance of extending the research already initiated (cf. II. 2.2) to identify characteristics of students whose college-going behavior will be most affected by scholarships. It is highly desirable to identify the variables which interact significantly with scholarship assistance in terms of effects on the college-going behavior of the talented, since such knowledge will enable us to use scholarship funds to greater advantage to both students and society.

The comparative effectiveness of different types of high school environments is currently a matter of great concern to secondary school teachers and administrators. A number of public statements purporting to assess high school effectiveness on the basis of production of Merit Scholars have appeared, but they have neglected to take account of differences in the initial talent supplies of high schools. Because of the questionable inferences being made from such analyses, it appears desirable to initiate studies of high school effectiveness which employ more adequate research designs (e.g., the design described in III. 2.1 might be used). Obtaining the necessary ability-input distributions for high schools may be a problem however. Inquiry into the types of secondary school environments conducive to the development of intellectual talent may actually be a more important type of investigation than inquiries aimed at assessing the effectiveness of various types of collegiate environments, since the greatest loss of high-level talent may occur in the high school. Furthermore, such knowledge may provide methods which are potentially useful for improving secondary school training.

An examination of student and parent questionnaires suggests that students and their parents require more knowledge about colleges. If recent work is correct in concluding that colleges select different kinds of student personalities, a more comprehensive knowledge of this process would result in a more productive matching of students and collegiate environments; that is, students could seek out more accurately colleges where they will be satisfied and productive.

The problem of college choice depends in a large part upon the images which students and parents have of American colleges and universities. Preliminary research indicates that there is a reliable hierarchy of college preferences in which a very limited number of colleges are regarded as "the best." A study of this hierarchy and its determinants might hold one of the major keys to student concentration. Similarly, some evaluation of the validity of the hierarchy may provide a rationale for scholarship administrators to deal meaningfully with student concentration in a limited number of colleges. It seems highly desirable to study the hierarchies of preferences for colleges among talented high school seniors, for any model of the decision-process with respect to college choice must include tenable assumptions about strengths and types of college preferences.

Plans for Longitudinal Studies of Talented Students

Tentatively, it is planned to follow-up each group of scholars for each college year and for the 2nd, 5th, and 10th years after college. This plan is outlined in the following table.

	Follow-up Studies by Year													
Scholars	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
1956	X	X	X	X		X			X					X
1957		X	X	X	X		X			X				
1958			X	X	X	X		X			X			
1959				X	X	X	X		X			X		
1960					X	X	X	X		X			X	
1961						X	X	X	X		X			X
1962							X	X	X	X		X		
1963								X	X	X	X		X	
1964									X	X	X	X		X
1965										X	X	X	X	

In general, the studies during the college years, will be concerned largely with the effects of college training and academic success. Post-college studies will be concerned largely with vocational, social, and life achievement and creativity. At this stage, the longitudinal planning is concerned with developing more explicit criteria and predictors for these achievements.

Research Staff

The following persons were employed on the research staff during the period covered in this report:

Name	Title	Period of Employment	% of Time
John L. Holland	Director of Research	Jan. 1-Dec. 31	100%
Donald L. Thistlethwaite	Associate Director of Research	June 10-Dec. 31	100%
Rex L. Hanks, Jr.	Research Assistant	Nov. 14-Dec. 31	40%
Laura P. Kent	Research Assistant	Oct. 4-Dec. 31	50%
John B. Suby	Research Assistant	Apr. 18-Dec. 31	40%
Barbara S. Uehling	Research Assistant	June 12-Aug. 31	100%
Suzanne F. Brua	Secretary	Aug. 2-Dec. 31	100%
Virginia O. Chalmers	Secretary	Oct. 16-Dec. 31	100%
Annette E. Kanner	Secretary	June 27-Dec. 31	100%

Contracted clerical services - 722 hours

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1. Holland, J. L. Undergraduate origins of American scientists. Science, 1957, 126, 433-437.
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